DOCUMENT RESUME

ED 265 850 IR 011 975

AUTHOR McManus, Jack; And Others
TITLE Developing Instructional Applications at the Secondary Level. The Computer as a Tool.
PUB DATE 85
NOTE 50p.; Paper presented at the Annual Meeting of the American Educational Research Association (Chicago, IL, March 31-April 4, 1985).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Case Studies; Computer Assisted Instruction; *Computer Literacy; *Computer Software; *Curriculum Development; High Schools; *Inservice Teacher Education; Instructional Innovation; *Microcomputers; Programing; Research Methodology; Staff Development; Teacher Attitudes; Use Studies; Word Processing
IDENTIFIERS Pepperdine University CA

ABSTRACT

Case studies are presented for seven Los Angeles area (California) high schools that worked with Pepperdine University in the IBM/ETS (International Business Machines/Educational Testing Service) Model Schools program, a project which provided training for selected secondary school teachers in the use of personal computers and selected software as aids to learning. The major purpose was to determine how microcomputers and software could be used to assist in the existing instructional process at the secondary level. An introduction briefly describes the IBM/ETS Model Schools program objectives, research methods, and techniques used for the case studies. Information is then presented for each of the schools, including the educational setting, microcomputer laboratory set-up, and a description of the computer applications that were developed. In addition, major issues that emerged from the project are discussed for each school: hardware, software, teacher training, time requirements, applications versus programming, school support, and school culture. Recommendations are presented for those planning or developing microcomputer programs in secondary schools, and eight applications that were developed in the IBM/ETS project are described. These applications used word processing (2), communications (1), a database management system (2), a database and graphics (1), and an electronic spreadsheet (2). A report on a formal course offering that is now part of the Pepperdine University Master of Science Degree in Educational Computing concludes the report. Lists of core software and software options and an outline of a computer curriculum module are appended. (JB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
OERI
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
[X] This document has been reproduced as received from the person or organization originating it.
[ ] Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official position or policy.

ED265850

Developing Instructional Applications at the Secondary Level
The Computer As A Tool

Jack McManus, Terence Cannings, and Chet McCall

Pepperdine University

Paper presented at the annual meeting
of the American Educational Research Association
March 31, - April 1985
Chicago, Illinois

IR011975

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Jack McManus

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Developing Instructional Applications at the Secondary Level
The Computer As A Tool

Jack McManus, Terence Cannings, and Chet McCall
Pepperdine University

I. Introduction

In 1983, the IBM Corporation initiated an $8 million philanthropic program in secondary schools in the three states of New York, Florida and California. It was titled the "Model Schools Program." The Educational Testing Service in Princeton, New Jersey, was selected to direct the program. The major purpose of this effort was to determine how personal computers and selected software could be use to assist the existing instructional process at the secondary school level. A total of 89 high schools were selected to receive 15 personal computers, three printers, and a large inventory of software.

In order to train teachers in these schools, 12 teachers training institutions (TTI) were selected to send two representatives each to Princeton for two weeks of intensive training on the IBM PC and such software as Easywriter, Visicalc, pfs:FILE, Delta Drawing and DOS. After their training, these individuals were expected to return to their home sites where they would train four or five teachers from each of six to eight high schools. These teachers were then expected to share their new knowledge with their students. The program moved very quickly. The TTI staff were trained in May and June, 1983; the teachers were trained in July and August; regular classes began in September.

Pepperdine university was selected to be a TTI in Southern California. Jack McManus and Terry Cannings went to New Jersey for the training at ETS. Chet McCall joined the program in September, 1983. In July, 1983, 26 teachers from seven Los Angeles area high schools were trained in an intensive four week program.

The IBM/ETS program had four major goal areas: 1) hardware; 2) software; 3) teacher training; and 4) network support. In addition, there was a definite effort to determine the use of the computer as a tool for the delivery of instruction. This report attempts to document the efforts to attain that last goal - the use of the computer as a tool. The population under consideration is the seven high schools whose teachers were trained by Pepperdine personnel. The time frame is September, 1983 to June, 1984, with selected reports on efforts that occurred from September, 1984, through February, 1985.

II. Organization of the Paper

This presentation concentrates on the techniques used by teachers in the seven schools who worked with Pepperdine University in the IBM/ETS Model Schools Program. An attempt is made to analyze the effectiveness of the teachers' ability to develop procedures that would enable students to learn by using the computer and software as aids to learning. However, it is felt that some background is necessary to put the paper in perspective. Thus, several other issues are presented. They include: summer training of teachers at Pepperdine University; a description of the seven schools; a description of the laboratories where the computers were located; and a description of the applications that were developed at the seven schools. Then there is a discussion of several major issues that emerged from project. They include: hardware, software, teacher training, time requirements, applications versus programming, school support, school culture and "other". These are described on a school by school basis, using fictitious names.

Next, there is a description of the applications that were developed. The paper concludes with a report on a formal course offering that is now part of the Pepperdine University Master of Science degree in Educational Computing.

III. Background

The Information Society is here. The past several decades have been marked by the rapid growth of information and the equally rapid development of technology to help manage and process that information

It is essential to the well being of a student entering today's and tomorrow's workforce that schools provide each person with knowledge of the electronic information technologies, and skills in their use. Schools must provide opportunities for all students to develop skills in the use of information technology as a tool for establishing meaning and communication, for classifying and ordering data and experiences and for opening up new approaches to learning.

However, according to Decker Walker, many secondary schools have followed a path of least resistance in beginning to use computers. In his study of 12 San Francisco Bay Area high schools, he found that computers were being fitted into a few comfortable niches where they disturbed things in the school as little as possible. More specifically, this survey conducted in the Spring of 1983, showed 15% of teachers and 26% of students reported some school involvement with computers... "The addition and deletion of an elective course is a relatively easy way to make change while making minimal demands on the rest of the organization." Walker found that few schools had central plans for integrating computers into school programs. Nor had they begun to involve the community, board or total teaching staff in any substantial way in planning for computer use across the school curriculum.

The IBM Corporation, in the winter of 1983, announced their intention to assist secondary schools implement the use of computers across the secondary school curriculum. The Educational Testing Service (ETS) was contracted to plan, train personnel for and implement the "Model Schools Program" in selected schools across the nation. Hopefully, the model would highlight effective strategies for implementing computer usage by promoting staff development programs, establishing computer laboratories and revealing the application of generic software programs in several curriculum areas.

IV. Objectives

The IBM/ETS Secondary School Computer Education Program was designed to define and demonstrate a model for introducing microcomputers in secondary schools. The program began operating in 89 secondary schools and 12 teacher-training institutes (TTIs) in California, Florida, and New York. TTI's chosen to participate in the program were selected primarily because of their involvement in educational computing and their experience in teacher training. High schools were chosen to represent a broad array of institutional and demographic characteristics such as urban/rural status, socioeconomic status, and private/public affiliation.

The orientation of the IBM/ETS Computer Education was toward learning to use the computer as a tool in a variety of secondary school curriculum areas. This approach encouraged the use of word-processing programs, for example, to help teach English composition and creative writing or using graphics programs in art, mathematics, and mechanical drawing. Data-base management programs and spreadsheets were also emphasized as teaching resources for secondary school teachers.

This study analyzes what happened in the seven secondary schools in the Pepperdine Consortium as they attempted to introduce application software programs (word processing, data base management, electronic spreadsheets) across curriculum areas.

V. The IBM/ETS "Model Schools" Program

The program contained four elements:

A. Hardware. IBM donated about 1,500 Personal Computers in connection with the program, or approximately 15 machines to each school and each TTI. Each donation was designed to provide a school with enough basic hardware to start an educational computing laboratory to which teachers could bring their subject classes on a regular basis. The hardware configuration in each school included, for each machine, a keyboard, a system unit with two single-sided disk drives, and a high resolution color monitor. In addition, schools received three IBM Personal Computer Graphics printers so that students could make hard copies of their work.

B. Software. Because hardware is of no use without adequate software, IBM chose to include a substantial amount of software in its basic donation to the schools. The first batch of software was delivered in tandem with the computers sent to each school. This software included the Disk Operating System (DOS) that makes the PC work. The BASIC computer language; Easywriter, a word processor; pfs:File, a data-base management package; Computer Discovery, a computer-assisted instruction program that teaches computer basics; and other programs and references for basic equipment operation and maintenance. The second batch of software was offered to schools on an optional basis: schools selected from a number of software packages marketed by IBM totalling $20,000 per school.

C. Training. In May and June, 1983, staff members of the 12 Teacher-Training Institutes who were working with the secondary schools underwent an intensive two-week session at ETS. This training focused on helping TTI staff understand the capabilities and basic operation of the IBM Personal Computer, learn how to use applications software, such as word processors available for the PC, and plan training for the secondary school teachers assigned to their

institutes. Also during the summer, teachers and administrators from each of the 89 schools attended a four-week session held at their TTI's. Over 350 teachers were trained in these sessions.

D. Support. The final component of the program was ongoing support, which was built into the program through the "network" concept. The network concept involves placing several geographically proximal schools together with a TTI. The TTI was given responsibility for working with the schools individually and as a group over the course of the 1983-84 school year. TTI staff organized network meetings, visited individual schools, responded to questions from school staff members, and, in general, acted as problem solvers and advisors.

VI. Research Methods and Techniques

One-year, intensive case studies were conducted at the seven sites within the Pepperdine Consortium. Data collection began the first day of training on July 5, 1983, and continued during the first year of implementation. Three researchers visited the sites on a regular basis.

Data were obtained by:

1. Visiting school sites to observe classroom teaching, interview participants and meeting with site administrators.
2. Examining revelant school project reports.
3. Conducting monthly workshops for project teachers at the TTI.
4. Collecting survey data gathered by ETS and at the school site.

Individual case studies were constructed for each school. The case study described the setting, the participants, the laboratories, and the implementation during semesters 1 & 2 in the 1983/84 academic year. In some cases, the case studies included semester 1 in the following academic year in the implementation description.

The three researchers utilized the constant comparative method to seek out commonalities and differences in implementation during the first academic year. The analysis began following initial visits to schools in the fall of 1983.

VII. The Case Studies

The case study records are voluminous. For the purposes of this paper we will describe very briefly:

- the summer workshop;
- each educational setting;
- laboratory set ups;
- instructional program developments during Semesters 1 & 2.

The remainder of this section will focus on eight issues which emerged from the study. Examples will be drawn from different sites to highlight the issues discussed.

A. Summer Workshops (July, 1983)

Twenty-eight teachers representing seven high schools met for 4 weeks in July 1983 at Pepperdine University to:

- learn how to assemble the PC;
- use the DOS:
- use application programs such as Easywriter; pfs:FILE, pfs:REPORT, pfs:GRAPH; Visicalc; and Multiplan;
- develop school site implementation plans;
- produce lesson plans in several subject areas using generic software programs;
- review currently available CAI programs;
- use a telecommunications system, namely, the SOURCE;
- develop a network entity for current and future problem-solving.

Teachers initially worked a 7 hour day beginning at 9:00 a.m. but as the training progressed, they began arriving prior to 8:00 a.m. to utilize as much hands-on time as possible. Each teacher was allocated one PC and printer and one copy of each software program. Teachers sat in school teams in the laboratory but worked in subject teams to produce lesson plans for specific areas.

The trainers learned a great deal from the four weeks' experience. Further details can be read in a 73 page report titled "Training the Trainers" written by the presenters.

8. Educational Settings

1. Hillside High School. Situated near the business section of Johnstown, the school offers a curriculum specifically for the student who desires a business career. Opened in 1981, the school population totalled approximately 650 students at the beginning of this study. It enrolled another 100 students during the ensuing 12 months. Occupying a renovated multi-level instructional resource center, the school had already installed a Hewlett-Pachard mini computer with 18 terminals. It was used mainly for teaching programming as a co-educational facility.

2. York Academy. Founded in 1972, this private school provides an education for students whose parents who can afford the $5,500 annual tuition fees. It is located in one of the prime real estate areas of West Johnstown and enrolls 480 students. The academy emphasizes high academic standards for college preparation. The 1983/84 catalog contained no description of computer literacy courses. Although each student is required to take at least five years of mathematics, no specific mention was made of computer usage.

3. Jefferson High School. A private religious school founded in 1953, the school strives to provide a "stimulating academic experience in a Christian

environment." The campus is situated on a spacious 30 acre site with 11 buildings serving the school's needs. It is a college preparatory school enrolling 500 students, grades 7 through 12. In addition, it provides a business and general studies curriculum as well as broad spectrum of extra-curricular activities. It is accredited by the Western Association of Schools and Colleges (WASC) and has 25 full-time faculty members.

4. St Josephs High School. St Josephs High School, a public high school, was established in 1894 and is the only high school in its unified school district. Student enrollment stands at approximately 2,800; the district serves an area with a population of approximately 110,000. The district is located southwest of downtown area of Johnstown and encompasses an eight square mile area, including 18 schools. The student population reflects the socio-economic structure of the community which ranges from lower income families to those of extreme wealth. Approximately 6% of the student body is transported to school by bus. Thirty percent of the students belong to minority groups, with the largest being of Spanish surname (15%).

The high school has approximately 150 certificated staff with six full time administrators. Over 80% of the students are involved in academic or college preparatory programs. Prior to the ETS/IBM Project there were 11 microcomputers available for the students with 9 terminals tying into a IBM System/34 minicomputer.

5. Rothchild High School. This school is a Christian high school located in the Rothchild Valley area of the Johnstown basin. Like most schools in the area, this school has a campus setting. This school, however, has no swimming pool and consists of several modest buildings of wood construction.

The school has classes in Grades 7 through 12, and a total school population of about 175 students. Until the program there were no computers located on the campus.

6. Canal Street High School This is a comprehensive high school with 2400 students whose demographic make-up is multi-ethnic, multi-racial. Perhaps more than any other school, this one is truly representative of the Johnstown area population. There are five major buildings in the campus layout. Recent statistics indicate that a significant percent of the graduates continue their formal education.

7. Rio Vista High School This is a comprehensive high school in the San Fernando Valley. They have a TRS-80 lab, in addition to the IBM lab, and are in the process of procuring an Apple lab. There are about 2600 students in the school. The area is affluent and there appears to be a strong involvement by the parents in the operation of the school and a strong commitment by the administration to academic excellence.

C. Laboratory set-up

1. Hillside High School A completely enclosed room was chosen for the IBM lab. Special wiring was installed at a cost of $2000 to the district. Computer tables were constructed by the district maintenance staff and installed during the first week of the semester. A parent added a 4" lip to the tables to allow use of the keyboard. The room had one entry but the door was left open during much of the school day. The computers were situated around 3 walls of the room with one printer to a group of 5 computers. The fourth wall contained a storage cabinet, screen and whiteboard. Students often sat 2 to a computer which insured a crowded atmosphere. Teachers could supervise student work by walking behind the perimeter groups.

2. York Academy Two rooms, located in the school's basement, became the computer center. Several Apples were already stationed there. An air-conditioning unit was installed which made these rooms a "favorite" visiting place during the hot summer months. A sliding window was also installed between the adjoining rooms for supervision purposes.

Ten PCs were installed around the perimeter of the "IBM" room. The five remaining PCs became part of a mixed lab with the school's previously purchased Apples. Class groups were taught in the "IBM" room. The other lab was available for small group instruction, free period use, and teacher preparation. The computer coordinator placed her desk, telephone and files in this lab also.

3. Jefferson High School At Jefferson, the PCs were placed in a computer lab along with 9 other microcomputers. The computers were placed three to a table in the center of the room with one table along the perimeter. Wiring was brought down from the ceiling to the floor which caused problems when feet kicked some cables. Large locks were added to the closets storing software. Parents donated an air-conditioning unit.

4. St. Josephs High School At St. Josephs two rooms were set aside as computer labs for use by the students and faculty. One room, available prior to the ETS/IBM project, contained 14 terminals tied into an IBM System/34. The mainframe was in a room separated from the terminals but accessible to the faculty and student aides. The second room, adjacent to the first, housed the IBM PCs and was used in a classroom environment with primary use being for programming instructions in BASIC and COBOL. A glass window provided visibility from one lab room to the other. Appropriate security precautions were taken and all software was stored in a closet within the PC lab.

5. Rothschild High School The laboratory was centered in a bungalow type classroom. A security system detected when the lock had been opened. The room was air conditioned, but the lighting appeared to be less than desirable. All 15 PCs were located on tables that were of appropriate height. The chairs provided good back support. There was a rug on the floor, which provided comfort and decor, but presented a potential problem with static electricty.

6. Canal Street High School All 15 machines were located in a former chemistry lab that was reconstructed. A security system was installed with an alarm on the door lock. However, it was jammed one night and 2 machines were stolen. In this laboratory, as in the labs in the Consortium, there were greaseboards. All chalkboards were removed to prevent dust damage to the disk drives.

7. Rio Vista High School The 15 PCs and three printers were located in one room on the second floor of the school. The room is ample in size and is located next to a laboratory of TRS-80 micros. The micros are protected by an alarm system that were attached to a siren at the top of the school. In addition, the computer components were connected to each other by an inconspicuous, but strong, wire. This alarm system was the gift of several parents of students in the school. The wire screens covering all the wires were also made possible by a donation.

D. Instructional program developments. Semesters 1 and 2.

1. Hillside High School The IBM computer lab was well utilized during the first semester. During periods 2,3,4, and 5 two classes spent part of their 2 hour period with hands-on activities. During periods 1 and 6, only one class was scheduled. In essence, more than half of the school population received some computer activities. For the double-class sessions, time was split with the teacher in the Hewlett-Packard room.

Half of the classes scheduled through the room were completing requirements for the "Introduction to Computers" course. These students began with "The Instructor" and proceeded to use Easywriter, pfs: FILE, and in some cases were introduced to Visicalc. They were also required to write a BASIC program which would print their name. In essence, this was a general overview course in which students learned some application packages. The other classes used the computers for BASIC programming.

Hands-on activities were somewhat of a problem: 36 students and 15 computers in a small-sized room. One teacher split the class in two: half with hands-on, half in an adjacent classroom reviewing articles in computing.

The computer coordinator (who attended the summer training) taught all the classes except two -- one of the other trained teachers taught these classes. The two remaining teachers were angry at not being able to use the room. One used it for two periods for word processing and one used it not at all as the room was too heavily scheduled by the computer science department.

During Semester 2, some minor changes occurred due to requests to the principal, by these two teachers. Of the six periods available two were allocated for the introductory course, three for programming classes (including one in Pascal) while the fifth was available on a sign-up basis. The math teacher used some of the fifth period for geometry (utilizing "Question") activities. However, little CAI was available for further use.

Selected students used the SOURCE to speak with students at a high school in Florida, a Lt. Colonel with the Air Force in Germany and personnel within the Ministry of Finance, Italian Government.

In summary, the scheduling of the lab prevented use by teachers in other subject areas-- a factor which caused friction between the four teachers who attended the summer workshop.

2. York Academy During the first semester all grade 8 students were mandated to attend a "computer literacy" course. The content consisted of an introduction to the PC, word processing data base management and discussion of a unit titled "Computers in Society". In addition, students were taught problem-solving through BASIC. Sixty students (three classes) attended this basic computer literacy class. The computer coordinator taught all three classes.

At the high school level students could choose "Computer Literacy" or an elective. The content of this course was similar to the computer literacy offered to all 8th graders. Four elective classes were offered each of four periods per week. Approximately 40 students attended. The computer coordinator and one of the summer workshop teachers shared this class load.

The two other teachers who attended the summer training used the PC's sparingly. One of them used the lab five times during the semester. She used Question to develop a table of elements in her science class. She was also interested in using Visicalc but felt compelled to teach the mandated curriculum. In fact, she was quite outspoken, "I'm ticked off; the demands of the curriculum stop me from using the Cab." The fourth teacher did not use the lab at all during class time: she used it occasionally for personal use.

The remainder of Grade 8 students attended the computer literacy course during Semester 2. The curriculum was similar to that taught in the first semester except that Delta Draw and Visicalc were added. Sixty students attended.

The electives were offered again to the high school students but only three introductory classes met with a total of 40 students. Two additional electives were, however, offered. Students who had completed the first semester elective could now study "Advanced BASIC" or "Programming in Pascal." Twenty students selected the first option while thirteen opted for Pascal. The computer coordinator taught both classes; sexes were evenly represented in each.

Telecommunications was introduced into the 8th grade computer literacy class toward the end of the semester.

3. Jefferson High School The late arrival of the PCs and the installation of security measures inhibited use of the laboratory. Time was spent backing up disks and organizing the software during the early parts of the first semester.

The PCs were used 2 periods each day by one of the teachers trained during the summer workshops. The other two teachers did not use the lab. For the "Introduction to Computers" class, students used "The Instructor" to learn about the PC but the majority of the semester was used to teach BASIC Programming.

Essentially programming was the only use of the micros for classes during the first year. Outside of individual use by students and some teachers little software was used as a teaching tool. Both a beginning and advanced programming class are conducted. The faculty is slowly becoming interested in the systems but none have adopted them yet. No major system breakdowns occurred. Teachers state that the systems are out of date for both RAM and disk drives. As a consequence much of the new appropriate software cannot be used. They have converted one system but that doesn't help the situation.

4. St. Josephs High School Pupil-free opening day sessions were held for all staff on the potential of the PC. Sessions were conducted in large groups as the PCs had not arrived in time for hands-on activities. At the start of the academic year, once the PCs and software had arrived, efforts were made to provide instruction to faculty. Individual sessions were available for faculty with release time being provided. During the year, the number of faculty actually using computers in their courses increased from 2 to 15 . The number of teachers owning their own microcomputers increased from eight at the start of the school to 26 at the end of the year.

The lab was initially used for teaching Easywriter and pfs:FILE, primarily. pfs:GRAPH was in introductory and advanced programming, using the BASIC manual. Main reason for constraint was poor memory (128k) and one-sided disk drives. They have upgraded since then. "IBM should have known better when they gave out the hardware and software," stated the head of the computer science department. There is now an intense desire on the part of students to match peer knowledge. The students have become very competitive. In addition "the game era is over." Students who were playing PACMAN at ages 6 and 7 are no longer excited by the

games. Another problem: 3 junior high labs are feeding into this high school. No capability exists to give the needed advanced training to these kids. Priorities seem to be mixed up.

5. Rothchild High School In the first semester, students were introduced to the hardware components and to Easywriter. A computer literacy class was offered to all seniors, since they had never had the opportunity to work with computers. Ninth grade students were offered this course as a part of the longer-range school plan to expose all of their students to computer applications.

For the first semester, the major effort was word processing. It was felt that this was the most applicable use of computers. Much of the material taught was designed to be as practical as possible. Thus, students worked on resume writing, the creation of business letters, and general business education skills. To assist the instruction process, teachers at this school made use of materials developed by another school during the previous summer training.

A math class was taught in the first semester also. Here, students learned BASIC programming as a tool for problem solving.

Students working on the school newspaper were introduced to the word processing capability in this semester and continued to use the laboratory for the rest of the school year.

In the second semester, the math class continued to learn BASIC programming, but was also introduced to Visicalc as a tool for learning algebra. For example, students created formulas in Visicalc that enabled them to calculate the hypotenuse of a right triangle or to compute the area of a rectangle. The teacher attempted to turn these capabilities into practical applications by asking such questions as:

What is the largest area that you can surround with 600 feet of fencing?

In the second semester, the computer literacy class was introduced to Delta Drawing, Visicalc, and the SOURCE. Again, applications were practical. On the Business Services section of the SOURCE, students were able to access the module

of resume writing and the creation of business letters. They were also able to practice interviewing skills, test them out in the real world and then review these skills at the computer. Students also got a chance to chat with other students in the program.

Visicalc was used by two students to calculate the tips that they earned at a drive-in restaurant. They attempted to determine average tip by type of car. They determined that Porsche drivers were the best tippers. In addition, students kept track of personal finances and athletic statistics.

In this semester, newspaper personnel continued to use the laboratory and then the yearbook staff began using word processing to prepare their text.

Additional applications included the following:

. Visicalc was used to set up a cashiering function, whereby students learned how to balance out at end of the day. This was similar to a bank teller drawer system.

. A grade book program was set up on Visicalc and students were allowed to view their progress in class at any time.

Finally, a seventh grade class came into the laboratory several times as a part of their class, the Wonderful World of Work. This was the WOW program that was a function of the career guidance department. Students were introduced to the computer as a tool for making their working life more productive.

6. Rio Vista High School In the first semester, much emphasis was placed on learning the hardware and then getting into the word processing software. This school bought their own copies of pfs:WRITE and that became very popular with most students, especially the business students. Word processing with pfs:WRITE replaced typing in the business division. With the Advanced Placement (A/P) students, Easywriter remained the word processing system of choice. The A/P students took home the pfs:WRITE manual to study for a weekend and determined that that system was not powerful enough to meet the needs of the A/P students. These students indicated that they would like to have used Wordstar.

Most classes had projects in Easywriter or pfs:WRITE. This involved mainly the creation, storing and printing of a file that related to a class assignment. In the A/P classes, business, math and science department, word processing was used to create the majority of written assignments.

In the A/P class, students used pfs:FILE to store note cards, i.e., an automated 3 x 5 card, to develop a bibliography for a term paper. Students then developed 10-20 different sorting algorithms to determine the fastest way to retrieve data from pfs:FILE. These algorithms were then compared for speed. After the note cards were completed, papers were written in Easywriter.

The SOURCE was used only briefly. There was concern that students would be able to determine the password and use up all of the allocated time. Also, there was concern that the Smartcom software would be abused, perhaps to access data bases other than the SOURCE.

Easywriter was used a lot by teachers to create order forms, letters to parents, and to prepare ditto masters. Pfs:FILE was used for lesson plans by creating three screens of information and then printing these screens onto one 81/2" x 11" sheet. This helped teachers meet the demands of the California Stull Bill, which states that teachers must have objectives and learning activities for those objectives for all of the materials that they teach.

Pfs:FILE was also used to help students create their book reviews, eight per semester. These reviews were turned in on pfs:FILE data diskettes only. No paper copy was used.

In the business division, word processing with pfs: WRITE became the standard. This system was used for word processing, resume writing, book reports, and general report writing. Students became quite comfortable using the word processor to create rough drafts. More specifically, the students were trained to compose a response to a classified ad at the computer.

E. Eight Issues

In this section we will discuss what we regard as the eight most important issues that emerged from our observation, interviews and analysis of records. Obviously, the issues are all interrelated and must be interpreted within the context of the entire program. The eight issues we will raise are hardware, software, teacher training, time, "applications" versus "programming", school support, school culture, and "other."

1. Hardware. As was mentioned earlier, each school received 15 PCs, color monitors, three printers, and a Hayes Smartmodern. Schools were required to set up the labs at their expense. In summary, the schools reacted to the hardware in the following ways:

> Hillside High School. As a separate lab, the PCs were used extensively, at the beginning for familiarization with the hardware. One PC and printer were stolen during a school dance and were not replaced until the end of the school year; the district was self-insured.
>
> York Academy. Teachers discovered that the hardware was more durable than originally anticipated. No problems were experienced with the keyboard or disk drives; two areas very susceptable to breakage. However, double-sided disk drives were considered a necessity by the teachers. The school was so impressed with the PCs that the principal decided to purchase another 5 PCs the following summer by selling 5 Apple computers. The other 5 Apples would be placed on carts and located in the library for school-wide distribution. One of the PC mother boards malfunctioned. The school failed to take out a maintenance agreement necessitating several trips to an IBM repair facility at some distance from the school. Unfortunately, few people at the local IBM regional office knew little about the project and were unable to assist with repairs or maintenance advice.
>
> Jefferson High School. No maintenance problems occurred except for some intentional damage by a student. The reason was not known. With the equipment situated in an air-conditioned lab, and with oversight by a teacher, the PCs functioned better than expected.
>
> St Josephs High School. With the introduction of the PCs, the total number of available micros and terminals increased to 50 from 22. The system performed quite well with little being required in the way of repair during the school year.
>
> Rothchild High School. It was felt that the hardware was easy to learn and that it was fairly easy to teach others about its use. There were problems with two machines, a CPU and disk drive on one, and a color monitor on the other. Both problems were fixed by IBM, since the machines were still under warranty. It was felt that the 15 PCs were enough for this school, given its rather small population (about 175). There was reference to the fact that the machines were delivered late, and that critical time had been lost. In all, there was much satisfaction with the hardware.

Canal Street High School. There were no significant hardware problems at this site. Two drive doors became disabled during the first semester, and were fixed under warranty by IBM.

Rio Vista High School. In general there was pleasure expressed with the hardware. Those persons who were touch typists complained about the keyboard. The Shift key drew the most complaints. Also, it was requested that the PC have a light that indicated when the machine was on. Without this light, some PC's were left on overnight, due to oversight. Others expressed concern over the drive doors, which could become disabled if they were popped open or closed. There was one request for a wider carriage printer for business applications.

All in all, "high satisfaction" could describe teachers' reactions to the PCs. At the beginning of the project we were uncertain as to the durability of the PCs. At the conclusion of one year, with just a few exceptions the hardware proved to be capable of coping with the physical demands of high school students.

2. Software. As one of the four key elements in this philanthropic program, schools were given specific software programs for use but were also given a choice in two selection rounds to obtain what they required. The software lists are contained in Appendix A. Five schools are cited in this section as examples of software use.

Hillside High School. The teachers rated the word processing package Easywriter as the most frequently used program. The data-base management program "pfs:file" was used in all "introduction to computers" classes. Typing Tutors and The Instructor were also used in this class. Delta Draw and Cross Clues were other popular programs used by the students. Although two teachers were skilled in the use of Visicalc, only one teacher used it for calculating grades. No teacher used it in the instructional program. The university loaned two PASCAL computers to the school for semester 2; they were used along with the computers the school had purchased for the advanced programming class. As a business school, some of the staff were anxious to obtain an accounting package. The school ordered multiple copies of the BPI Accounting Program for use in the second year. Some problems were encountered with students "wiping clean" two program disks. These were not replaced by the donors. Managing the use of student and program disks also created organizational problems. Two filing cabinets were installed to help alleviate this area of concern.

York Academy. Easywriter had a mixed reception with classroom teachers. Some found it a waste of time for two reasons: a. it required too much time to teach, and b. high school students do not require the sophistication inherent in this word processing package. However, other teachers used what was available but also recognized its weaknesses. Some teachers preferred Bank Street Writer to this program due to its ease of use. All teachers expressed the desire to try pfs:WRITE over the vacation and try it as another option. Other programs such as pfs:FILE were rated as "great", due mainly to the ease of use. Some teachers, though, found difficulty in adapting it to their subject area. Visiscalc was rated "good" but teachers emphasized that learning this program requires good pedagogy. Delta Draw received high praise from students. Teachers also stated that it was a good package to teach introductory programming. Other programs such as Question, Free Enterprise, and Snooper Troops were used by groups of students, particularly boys.

Rothchild High School. The most common application was word processing with Easywriter. However, there was much use of Visicalc, Delta Drawing, pfs:FILE, and pfs:REPORT. The BASIC interpreter was used frequently.

Easywriter was used for resume writing in a business class, as well as for the writing of articles for the school newspaper and the school yearbook.

This school became actively involved in telecommunications with the SOURCE. They used the resume writing module extensively and also reviewed the Interviewing Skills module. Visicalc applications included the development of a cashier model to show students how to balance out at the end of the day. A bank teller drawer system was also developed.

Canal Street. By far the most popular software was the BASIC interpreter. There were two courses in BASIC offered as a part of a mathematics classes, mainly for enrichment. The other popular package was Easywriter. Several teachers brought their classes into the laboratory to work with word processing applications. These included teachers of English and business.

Rio Vista High School. During the first semester, the majority of the time was spent setting up the laboratory. Students also had a chance to work on word processing and a data base management system. More software was used in the second semester - FILE, GRAPH, REPORT, and the Instructor. An Advanced Placement program for computer science was instituted and all but one student received college credit for the course.

The journalism class used the lab to write the school newspaper. One teacher used File and Easywriter to prepare term papers and book reports. Business classes used the word processor to develop required skills.

In summary, word processing was the most commonly used program. Students used Easywriter not only in class time but during free periods to complete papers. The number of students using the word processing facility was growing on a weekly basis.

For introductory classes, programs such as Typing Tutor, The Instructor, Delta Draw, Cross Clues were popular. Computer Discovery was not used at any school.

The use of DOS 1.1. BASICA became popular in some schools while some schools requested more PASCAL computers.

3. Teacher Training. Along with setting up the labs and backing up program disks, teacher training became the most important thrust of the program at the beginning of the first year. Teachers had left the summer training with specific and detailed staff development plans. In many cases these plans were carried out but not to the extent envisaged.

Hillside High School. The principal allocated half of the student-free staff development time to training other teachers on using the PC. The four summer-trained teachers all participated in these sessions. Unfortunately, the principal did not participate in these sessions, a fact noticed by many staff members. Half of the teaching faculty attended the first session and approximately the same number during the second. Teachers were introduced to a new program called "Exploring the PC." It was purchased by one of the trainers. Some teachers began to learn Visicalc (but with no follow-up session) while others explored Typing Tutor and The Instructor. As part of the session, teachers used "Easywriter" to type their Resume. One of the teachers produced two newsletters during the first semester to spread the news of the computers and the staff development workshops. However, one fact became clear: why train all the teachers if the computer lab is not available for class use?

York Academy. All four teachers expressed great disappointment in this aspect of computer use. The late arrival of hardware and software was, in their opinion, a major tactical error. The first week of the semester when teachers were enthusiastic and ready for hands-on training was lost. Little advancement occurred during the remainder of the year.

During the first semester the computer coordinator offered her services to train other faculty before and after school and during the lunch break. Only four (out of a possible 45) took advantage of this offer. She purchased a copy of Bank Street Writer to use for staff development.

Of those who learned to use it none used it with a class. Teachers were also encouraged to use the "lab." section at any time during the day - very few availed themselves of the opportunity.

In addition to the four who worked with the coordinator another four teachers had bought their own microcomputer for use at home. Two of these teachers used pfs:FILE for their own record-keeping but did not require any assistance from the summer-trained teachers. As the coordinator said, "It appears that only 10% of the teachers are interested in computers; the others can't be bothered or are just too busy."

A feeling of euphoria to that of frustration had marked the early weeks at York Academy. Great difficulties as suggested above were encountered in attempts to move a very traditional faculty into the microcomputer age. Many did not have the time or were willing to find it to explore the microcomputer world. Teachers felt constrained by the curriculum they were expected to cover and this task became another burden on an already packed teaching load. With a feeling of intimidation and time pressure the area of staff development was one of the great disappointments for the four who attended the summer workshop just 12 months previous.

The principal appeared supportive; he used the PC once in his own class and was willing to purchase another 5 PCs. But the next level of administration, department heads, was very difficult to motivate. It appeared that dealing with each department head individually was an appropriate strategy. Selecting subject-oriented software by the department head would be facilitated by the computer science coordinator. One question still kept arising: what do you do with the classroom teacher who sees no need whatsoever to use a microcomputer either personally or in the classroom?

Jefferson High School. Inadequate time was allowed for training due to late arrival of the equipment. Only two teachers actually taught during the first year and their efforts centered primarily on introductory and advanced programming classes. Very little release time was provided for teachers to become familiar enough with the computers and software to utilize them appropriately across the curriculum. As a consequence, teacher enthusiasm was virtually absent after the initial introduction of the micros. Teachers were not permitted to take micros home where individual learning could lead towards a renewed interest. However, the school organized a two-state conference for high school teachers in which they devoted the greater part to computer education.

St. Josephs High School. Once the systems were installed and working, faculty were given an opportunity to attend special training sessions, held by those who attended the summer training at Pepperdine University. These sessions were designed to acquaint them with the hardware and system operations. In addition, interested faculty were exposed to several generic software programs including pfs:WRITE and pfs:FILE. Faculty who were initially reluctant to avail themselves of the training began to sense the need for such training to keep up with the others. As a consequence of this training, about 30 teachers are qualified to teach students about computers, as contrasted with only five the year before. During the year 89 teachers and staff took some off-campus training on computers; that is, better than one out of every two staff.

A Staff Development Coordinator was formally appointed to assist in such training, not only at St. Josephs, but also throughout the District.

Rothchild High School. Training for teachers on the IBM PC was done on an "as available" basis in the first semester as the school never developed an intensive program of PC involvement. For example, most of the training for individual teachers was done when parents did not show up for conferences and when one of the two remaining teachers was on a free period. Consequently, not much structured teacher training ever took place at this site. Specifically, there are about 20 teachers at the school. Of these, eight or nine, in addition to those trained at Pepperdine, received at least one hour of training on the PCs.

Canal Street High School. There were three two-hour meetings held in the first semester of the 1983-84 school year. One-third of the faculty attended each of these meetings. The principal was present to encourage attendance and to show support for the program. The faculty was introduced to the IBM PC in the laboratory. Then, each teacher had an opportunity to work with the software packages of his or her choice. These sessions were held on staff development days, which are shortened school days when students come to school two hours late. Training after these sessions was held on an appointment basis. During the first year, there was little training activity. Most of the time was devoted to setting up the laboratory developing routines for effective management procedures.

Rio Vista High School. All of the teachers in the school were trained for at least three sessions of two hours each. Easywriter and Visicalc were taught, in addition to "DOS" and the computer itself. Subsequent training sessions were held on a department basis. The english, science and mathematics departments received three full-day instructional sessions. In addition, individual faculty were trained on a scheduled basis by the four teachers who were trained at Pepperdine.

As can be seen, the approaches to staff development were varied but some common themes emerged:

1. The late arrival of the PCs, three weeks into the semester, negated earlier plans to introduce faculty to the PC before the students arrived.

2. Large group sessions resulted with little or no hands-on activities which, in many cases, did not create a positive climate for some faculty.

3. Attempting a program such as Visicalc in an introductory session was not a good idea. Programs such as Exploring the PC, Typing Tutor, and The Instructor were more successful. Word Processing was the best introduction for teachers. It was a program they could use immediately.

4. Allowing departments to sign up on a group basis emphasized the need for software suitable to the particular subject area. For many teachers, CAI software is a good introduction to the use of computers in the classroom. They see it as having immediate content relevancy .

5. The presence or absence of the principal impacted staff attitudes toward using the PCs. This finding is not new -- the ever-popular RAND study emphasized the importance of principal attendance at all training sessions. Although these principals attended two days of the summer training session, it was insufficient. They must attend similar sessions at the school site to communicate the feeling of importance of the project.

6. After the initial staff development sessions, individual appointments appear to be a good investment also. However, some faculty are just "hard to get." What do you do with these people?

7. Staff development programs took longer than anticipated. Many of these efforts will continue into a second and third year. Convincing some department heads that the computer can be used as a tutor and a tool will take time. Buying specific pieces of software for particular subject use may help these department heads.

8. Home-use of the PC is a must. Allowing teachers to sign-up for weekend or overnight use is worth the investment. Few maintenance problems occur with the PCs travelling to houses.

9. Once faculty members become "hooked" they are inclined to purchase their own micro. Purchase plans, arranged through a local vendor, will promote more active faculty use.

10. Teacher release time is the best approach for staff development. Expecting teachers to remain after school or attend Saturday workshops was not worthwhile. Release from the demands of the classroom is received warmly by most teachers.

4. Time In the context of this paper, "time" has two meanings: a) time to implement the project, and b) time for teachers to seek classroom applications for generic software across several subject areas.

First, we will discuss "time" to implement the project. The narrative thus far has suggested that the greatest part of the first year was spent establishing the lab, preparing the software for us, organizing classes and conducting staff development. One of the main purposes, if not the major one, was to produce classroom applications for word processing, data base management and spreadsheet programs. Little of this occurred in the first year. It is our contention that the second and third years would produce many of those applications. Unfortunately, the support for the program concluded after only one year despite requests from several TTIs to continue phase I of the Project.

Second, teachers need time to prepare applications, learn the software packages and promote curriculum integration. Much of what was expected in this project was in addition to the demand of the regular school curriculum. Producing sufficient effort is fine, but finding the time to accomplish the task is another factor.

Some examples are:

York Academy The project teachers were required to undertake other "extra-curricular" activities such as coaching sports teams, organizing social events and attending numerous committee meetings. In addition, time to cover the expected curriculum was short. As was stated earlier in this paper, one of the teachers felt compelled to teach the mandated curriculum and became quite outspoken, "I'm ticked off, the demands of the curriculum stop me from using the lab."

Canal Street High School Our observations showed that this was a major factor. As most schools discovered it takes a lot of time and effort to set up a laboratory and establish procedures that will make it work well. Teachers were not afforded a free period. The use of a student teacher was the only way in which the lab coordinator was free to run the lab. There was no compensation for this position.

Rio Vista High School This was a major problem. Teachers received no release time. They completed all of their tasks after work and on their own time. They covered for each other and shared time in the room that would maximize impact.

In summary, it appears that if applications are to be developed by teachers time available during the normal school day will negate that effort. Release or reassigned time may assist in developing more applications.

5. "Applications" versus "Programming" The Johns Hopkin's survey found that the longer a school pursued the use of computers in education, the more they moved into teaching programming skills. That also appeared to be the case in this project. The reason appears to be two-fold:

a) Producing or creating applications for generic software is not easy. It takes time, effort and a knowledge of the programs.

b) It is much easier to receive approval for introducing BASIC programming courses -- the textbooks are readily available, teachers can assure 100% computer utilization, it is very easy to test, and every machine comes with in-built BASIC.

Some Examples:

York Academy As one teacher said. "They (applications) are only as good as the teacher who creates them". The number and amount of generic applications developed disappointed all teachers. They felt that two reasons contributed to this fact. One, the first year was spent learning to use the hardware and software. Two, time was a crucial element in developing new and creative uses for these programs.

Hillside High School A fifth teacher was hired as a member of the computer science faculty. She possessed programming skills in both BASIC and Pascal. Along with the computer science coordinator, they combined to become a formidable programming team. However, they both stated that during the second year, attempts would be made to reduce the amount of class programming time. Unfortunately, the number of programming classes scheduled prohibited the use of the lab for application lessons. Other teachers attempted to use the lab for math and English classes only to be informed that the schedule would not permit it. Consistent demands by the teachers "freed" the lab for one period per day during the second semester.

St. Josephs High School Although a lab of computers had been in existence for some time, this project created a computer science department at the school. The implication was simple: the computer science faculty would plan and coordinate the use of the lab. The major user thus became the programming classes -- they could use the room consistently, a factor which impressed the school's administration. The formation of this department, however, caused a rift amoung the participating teachers. In fact, 12 months later, the dispute widened when the computer science department head locked all the doors and kept the keys (for security reasons).

We are convinced that the average teacher requires assistance with using the computer as a tool in the classroom. In so doing, the use of modules, attached to specific chapters in district and site-adopted textbooks, would promote curriculum integration. These modules should contain a) preliminary off-line activities, b) computer activities, c) accompanying materials (student worksheets, background reading, teacher guide including bibliography, lesson plans, data diskette), d) post-unit activities (enrichment, review, evaluation activities), and e) documentation (guide to developing similar materials, experiences using modules in the classroom).

An outline of the proposed curriculum module is presented in Appendix B. We stress that these modules would be used within existing curriculum guidelines and be aligned to adopted texts. That is, the modules would supplement and complement classroom activities -- they are not something "extra" to be added to a teacher's already busy day.

6. School Support In this section we refer to the support by the school site and district administrators. This factor influenced greatly the project's development. During the early stages of the project, some principals indicated their support by attending all project meetings. Others sent a deputy or simply an apology. These actions communicated certain messages to teachers.

Obtaining release time to attend the monthly workshop meetings presented a "challenge" to the many teachers. At the smaller, private schools teachers asked their colleagues to cover classes for them. At some of the larger schools

teachers took a "sick" day enabling a substitute to be hired for their classes. At some schools teachers actually lost salary to attend the meetings. The group had built such cohesiveness that attendance was always above the 80% mark. But this fact was not a result of school and administrative support. In fact, it was a credit to the teachers that they attended these meetings. It was a pity that continued administrative support was not forthcoming.

Other examples of school support included:

Hillside High School The principal allocated a major portion of his staff development time to training other faculty on the PC's. However, he attended to the needs of the computer coordinator while disregarding the other trained teachers. Three teachers became very negative toward the project as they were unable to reserve the lab when they needed it.

York Academy No release time was available during the first year to train other faculty--they were expected to become proficient during their own time. No release time was available to attend monthly workshops.

Jefferson High School Minimal support was offered by administration as evidenced by a small budget with maintenance of hardware as the primary function. No release time was provided for teacher training.

St. Josephs High School As stated earlier, the school was most supportive of faculty training, and provided excellent release time for initial training of faculty who expressed an interest .

Although support was high in most areas, a lack of funding caused a slow down in the installation of the SOURCE system for communicating among the various schools in the project. This was viewed by management as a "terminal" program, due to die for lack of funds at the completion of the project.

Rothchild High School There appeared to be little special support for this program. There was no released time for teachers, and the setting up of the laboratory had to be done during consulting periods and after school. This was a particular problem here, since most of the teachers had second and third responsibilities at the school.

Canal Street High School The laboratory was staffed with an aide for about four hours per day during the first year. During the second year, 10 student aides were hired to run the lab from ½ hour before the opening of school to the end of the school day. The teacher in charge of the lab had a student teacher, which freed him for one hour per day in the lab.

A budget of $500 was set aside to support the laboratory. In addition, there were night school classes in computer literacy, which afforded additional employment for teachers. The school computer program also received $25 per student enrolled. To date this year, the program has received about $1100 in revenue from this program. It is also possible for this school to rent its facilities to universities to conduct their classes at the lab. This approach has brought in an additional $500 for school year 1984-85.

Rio Vista High School Strong support was evidenced from the administration. The assistant principal was personally involved in the project much of the time, and the principal was always willing to lend his support and time when needed. They also encouraged the teachers to apply for external funding to help the computer program at the school. Recently, the school was the recipient of a $16,000 grant for computers to assist in the instructional process.

In essence, although all district administrative offices had signed a contract to support the project, once the PCs arrived at the school with the accompanying software, promised support did not always materialize. Teachers, often left to their own devices, became disheartened as they felt it was "their" project, not the school's.

7. School Culture. Seymour Sarason's term had a familiar ring in this project. The norms, values and mores within each school impacted the project's development. Some examples are listed below:

York Academy Moving a staged and conservative faculty toward implementing technology into the curriculum became a very difficult task. Preparation for college was the thrust of the Academy--computers were an additional choice that was not part of the curriculum. The task of using computers was allocated to the computer science teacher.

Jefferson High School Initially strong student support and enthusiasm over the program evolved as new hardware and software arrived. However, only one of the three teachers in the program remained involved; one became disinterested; and, the other left the school. Due to no apparent policy within the school, faculty continue to feel uninvolved and less than excited.

St. Joseph's High School Due to the competencies of the training teams, an excitement was generated during the year as more and more teachers became familiar with the available PCs and their capabilities. Plans called for full day substitutes for teachers so that they could spend a full day in the lab learning how the PCs might best suit their individual needs.

Due to the expanding interests in the PCs and microcomputers in general, students were flocking to the labs, anxious to work on the systems and to use the SOURCE. There was great difficulty in coping with this demand due to lack of qualified persons on continuous duty. A continuing enthusiasm existed among faculty, even though their differences regarding operational aspects of the system were apparent. Many faculty enrolled at other schools and were bringing back to St. Joseph's their new found competencies, a situation which can only enhance enthusiasm at the school.

Rothchild High School This is a very conservative school with virtually no discretionary funds. It was thus difficult to get any additional funding for the program. By the end of the first year, the need for more money for supplies and software was becoming apparent, and a certain frustration was developing, since there was no money in the outlook.

Canal Street High School There is more support for the program this year than last. The school faculty is mature and rather conservative. Thus, it was not surprising that the computer lab did not become the focal point in the school overnight.

However, there are now indications that more and more teachers are becoming involved and are bringing their friends. Thus, it appears that the laboratory is becoming a bigger influence in the school operation. As in the past, word processing is the major area of interest. It is estimated that 15-20% of the faculty had involvement with the computer lab in school year 1983-84 and that 40% of the faculty have become involved in school year, 1984-85.

Rio Vista High School A noticeable characteristic of this school is the commitment on the part of the faculty to make this project work, just as it was designed by IBM/ETS. Each of the five teachers is actively involved in teacher training and lab use. The administration is very dedicated to assuring that resources are available to the faculty. There is a night program, by which the teachers receive extra pay, and the program receives money to assist in defraying lab running costs.

The enthusiasm and attitude of the teachers who participated in the summer training was evident at the schools early in the fall. However, due to many frustrations in some schools, a feeling of euphoria and apathy grew by the end of the second semester. Perhaps more active support by site and district personnel and the TTI may have overcome some of these negative feelings. However, TTI personnel can have little impact on school culture--it is the people within the institution who must generate positive feelings and attitude.

8. Other Factors. This is a catch-all area in which we mention some other factors that we perceived as influencing the project. We will mention just a few:

York Academy The area of telecommincations became a difficult area for most teachers to develop, both as a tool and for their own use. Learning the software was not easy as was connecting the cables to the equipment. It appears that the TTI should have spent more time with "hands-on" activities during the monthly training sessions. Some teachers also stated that the raison d'etre for the use of the SOURCE was difficult to understand. That is, some felt that not all subject areas would benefit from the use of this facility. It also required more time commitment, both in learning to use the device and training students to use it. One teacher suggested that using the U.S. mail to "warn" teachers as to current and future use was more preferable than mandating its use to order software. This approach was not well received, particularly when the instructions were not clear. Teachers using telecommunications need strong support at the local level as the number of problems encountered simply raised frustration levels and negatively impacted use.

Canal Street High School Currently, the lab is scheduled for the entire day, every school day. In addition, faculty and students are invited to come into the lab ½ hour before school for individual training or just to use the micros. The lunch hour is also reserved for sign-ups. There is an average of 8-10 people every morning and a waiting list at lunch. Students and teachers share these systems during this time and they are served by student aides.

There is also a computer committee of faculty that has recommended that the IBM lab be used for business classes and other courses throughout the school. It was recommended that the Apple lab be used mainly for CAI. However, this proposal is still awaiting approval.

Rio Vista High School This was the one school to have a ribbon-cutting ceremony to announce the opening of the lab. A plaque was dedicated to IBM for their contribution.

A noticeable characteristic was parent involvement. The security system, which was by far the best in the project, was donated and installed by a parent. The location and physical setup of the laboratory indicate that the administration is extremely supportive of the program.

However, the teachers are tired and worn out. In a sense, the school has "gone to the well" too often. It appears that it is now time to expand the base of the training core to allow other people to participate in the process.

These examples illustrate the time factor once again. The use of telecommunications could have been left to a second year if the project was extended. Teachers needed time for set-up and staff development during the first year. It is now, toward the end of the second year, that many staff members are beginning to show an interest and become involved.

In some cases, the better teachers were again asked to carry the extra burden. What do you do about this situation? Can we continue to expect the highly motivated and gifted teachers to pull colleagues into the information society?

VIII. RECOMMENDATIONS

The following recommendations arise out of the issues mentioned above and are relevant for those planning or developing microcomputer programs in secondary schools:

A. Hardware The formation of the computer labs, each with 15 micros, appeared adequate for this program. However, in planning the labs consideration should be given to:

. Delivery time -- allow the manufacturer ample time in which to deliver, and perhaps install the microcomputers.

. Purchasing sufficient numbers of peripherals -- one printer to five micros was just adequate. Some schools installed a switching device enabling a printer to be used from any one of several micros.

. Providing adequate equipment -- double-sided disk drives and a minimum of 128K are essential in today's world.

. Installing adequate security -- both at the micro and room level It will always involve additional funds, but may, in the long run, be worth every cent.

. Investigating several maintenance plans or arranging for a district employee to receive training on the maintenance of the machines purchased. In similar view, clarify the warranty period and place of delivery for service.

B. Software Schools in this project were initially given specific software programs and then permitted to choose from selected lists. Obviously, hardware is of little value without software. In selecting software, teachers and administrators should give consideration to:

. Promoting the use of word processing programs as the initial and perhaps most important function for all students.

. Selecting appropriate CAI programs for particular subject areas. Although the focus of the project was using the PC as a tool in the classroom, many teachers initially will feel secure in using software directly related to their subject expertise.

. Backing up all program disks -- a tedious chore but well worth the effort.

. Encouraging teachers to use data base management programs for maintaining current and accurate student records.

. Allowing ample time to learn spreadsheet programs -- these are often difficult for the average student and teacher to learn. Finding curriculum applications are often even more difficult.

C. Teaching Training This area became the major focus of the project during the first year. Future planners must take heed of the following:

. Providing release time for initial and ongoing training.

. Insure the principal attends several sessions. This project necessitated two day's attendance at the summer workshops. It was insufficient. Five days of initial training would be more appropriate but with ongoing education during the project life.

. Providing a communication system or network for subject-area teachers to place application ideas.

. Supporting the new program during the school year. A school site or district person readily available to assist with practical ideas and suggestions must be provided.

. Presenting word-processing as an introduction to computers for the neophyte. That is, stay away from programming languages in early training sessions, or for that matter, stay away from them entirely.

D. Time This was one of the most important factors which contributed either positively or negatively to the project's development. Future developers must consider:

. Allowing a 3-5 year time period to implement a program of this magnitude.

. Allocating time at the school site for teachers to work with and learn the technology.

. Bringing groups of teachers together to create, design and implement applications for the secondary classroom. This effort will necessitate organizing the school schedule for student-free period.

. Establishing a computer lab schedule that permits all subject-area teachers to use the facility, not just teachers of computer science.

. Establishing a network system for teacher to teacher communication.

E. "Applications" versus "Programming" The number of applications developed was disappointing. The number of schools who formed computer science departments and focused on teaching programming skills, increased as the project progressed. Please consider the following recommendations and facts:

. The need to develop modules to assist the average secondary classroom teacher use application programs.

. These modules should be aligned to curriculum frameworks and specific chapters in adopted texts.

. The modules must complement classroom instruction, not add to the already heavy demands of the classroom teacher.

. The formation of computer science departments focuses the use of computers on just a few teachers. "It is their job, not mine," state many subject-oriented teachers.

. Many computer science departments will dominate the use of the lab and will monitor its use.

F. School Support. The support of administration is essential to a new program's successful implementation. The planners of new programs involving microcomputers should consider:

. Allocating specific staff development times for hands-on activities.

. Involving the principal in those activities.

. Extending the principal's training sessions. In this project principals attended only 2 days of summer training. That period needs to be extended to at least 5 days.

. Involving school-wide faculty in micro training, not just the math, business or computer science faculty.

. Providing funds for updating software programs.

. obtaining a maintenance agreement which provides for easily accessible technical assistance OR training a district person to undertake minor repairs.

. Arranging faculty purchase plans.

. Paying teachers for the extra work requested to do staff development and creation of modules.

G. School Culture. The attitude and support of faculty at each school varied greatly. Teachers at one school viewed micros as a chore that should be tolerated, but not implemented. While at another, teachers exhibited their interest by purchasing their personal micro. In future plans we suggest:

. Active administrative support through the early involvement of department heads in training.

. Creating an incentive or reward structure to encourage faculty participation.

H. Other. Of several recommendations that could be stated we will restrict ourselves to suggesting that:

. Telecommunications should not be included in early implementation.

. Electronic mail systems can be used by teachers to exchange ideas but the utilization of this resource takes time to develop.

. Parental support can provide essential laboratory equipment to insure adequate security.

. Local media exposure will promote greater parental interest and support.

IX. Eight Applications

This section describes briefly eight of the applications that were developed in the IBM/ETS project. Two of the applications used word processors, two used a data base management systems, two used an electronic spreadsheet, one used a combination of a data base and a graphing program and one used a combination of data base and graphics. Again, it should be noted that these applications used generic pieces of software to deliver instruction directly or to assist the students in their own learning process.

A. Word Processing

1. Students used the word processor to create rough drafts of documents in a business sciences class. While this may not appear to be a major breakthrough in applications, one should not overlook the significance of this application. The ability to create document at the word processor may speed up the writing process and increase productivity in a business setting.

2. Students used the word processor to develop their school newspapers and draft copies of text for their yearbooks. Advisors to these projects found that the student interest in writing was increased and productivity was improved. In addition, these teachers tended to use the word processors in their own classes, and thus expanded the use of the computer in their school.

B. Communications

3. Communications used a modem and a phone to contact the "SOURCE. They used the Business Section to review instruction on writing resumes. After that session, they returned to their word processors to create their own resumes off line. These were then compared to the sample resumes on the SOURCE. Students were able to revise their own work, based on the suggestions and samples on the SOURCE. Such exercises can prove to be very beneficial to students looking for jobs.

C. Data Base Management System

4. Students developed a bibliography for a term paper on a data base management system. They treated the file as a series 3" x 5" cards for bibliographic entry. The data base was expanded to act as a group of 4" x 6" or 5" x 8" cards to include substantial information from each article read. Each record has a set of key words that permits students to retrieve the appropriate information when it is time to write the term paper. Students coded their records by various criteria, such as topic or section of the paper.,

5. pfs:FILE was used to create book reviews. Students created a data bse form using the typical elements that are used in book reports. Students then read books and entered their reports into the data base. There were several reviews of each book and students had a special section where they could give the book a rating from 1 to 10. This rating was used by other students to determine which books they might consider for subsequent reports.

D. Data Base and Graphics

6. Students in a marine biology class went out on the school boat on a regular basis to gather information about the ocean and the marine life in it. A data base was designed to enable the class to store the data that they collected on

the water, its temperature and salinity, as well as the number of fish caught that day, currents, and other types of marine data. This information was then passed on to the graphics package where it was displayed. Students were able to begin drawing cautious conclusions about the relationship between variables. The ability to display relationships in a graphic manner and to enable students to begin seeing these relationships is a significant instructional event. Students are able to begin seeing the world in a different manner, and it is expected that students will use this generic capability to examine other types of data.

E. Electronic Spreadsheet

7. A math class inserted formulas into a spreadsheet to allow students to examine such entities as the area in a rectangle. By inserting two of three values, students were able to compute the third values. By several iterations of this process, students could see the relationships that exist in the formula. The teacher then introduced word problems of a practical nature, and students were able to calculate such figures as the cost of materials for a fence to surround a lot that is 100' by 50', given the cost of a linear foot of lumber and the price of nails. A similar program permitted students to compute the various dimensions of a right triangle. This program is another that permits the students to examine relationships among variables.

8. The students created a "cash drawer" with Visicalc. Then students entered the beginning balance for the day and were then instructed to enter each transaction, with a notation as to the method of payment, amount tendered, amount of transaction and amount returned to the customer. Transfer of any funds to other accounts were recorded. At the end of the day students were required to assure

that the cash drawer balanced. Visicalc kept a running balance, and when adjustments were made, it was easy to determine whether or not mistakes had been incurred. The spreadsheet allowed a double check of the cash transactions, since change was automatically computed and the balance updated. Students were requested to assure that amount of payment was accurate, and that the cash tendered was counted correctly.

X. Work At Pepperdine

Pepperdine University offers a Master of Science degree in Educational Computing. Students are mainly practicing elementary and secondary school teachers who are involved in computer activities in their schools. One course, Introduction to Instructional Applications, now concentrates on the development of instructional modules, using generic software and the computer as a tool for instruction. To date, students have generated some exciting applications. A discussion of five of these is presented.

A wide range of applications has been demonstrated. For example, in Kindergarten, students are presented with a row of five characters, four identical and are different. The student is asked to press the Right Arrow key until the cursor is below the "different" character. Then the student presses the Delete key (on the IBM PC) and the "different" character is deleted. All of the characters are now the same. To get to the next screen, the student presses the PgDn key (Page Down). Another set of characters is presented. To assure that only the small set of desired keys is pressed, the majority of the keys are disabled. Then, the important keys are color-coded. Next, the students' finger nails are color-coded to match the key that each finger would press. A major concern here is the ability of the young students to read the screen well enough to discriminate the shapes. Thus, it is recommended that the teacher use a word processor that allows the user to generate characters at 20 columns per screen.

A second example uses high interest text to encourage students to correct spelling errors and to rearrange the sentences into a more appropriate organization. This exercise is aimed at second year high school students in history, but could be modified for use in Grades 4 through 12, in almost any subject matter area. Four paragraphs are presented on the screen. Students, working alone or in groups, are first asked to correct the spelling errors. Then, they are asked to rearrange the sentence order to make a more smoothly flowing text, that takes into consideration the idea of a topic sentence. As discussion work, students determine what other meanings could be derived if the sentence order were changed.

This exercise enables the teacher to deliver content in an interesting way, while reinforcing the concept of the topic sentence. Students also get a chance to work with the word processor and become proficient in such skills as the Block Move.

Another creative application involves the use of the word processor to examine poetry. A well-known peom is entered into the word processor in advance by the teacher. Mistakes are inserted (extra words, syllables, different words, etc.). The students are then asked to examine the poem on the screen to determine the meter. The teacher suggest techniques for this. That done, students are asked to determine which lines contain mistakes. Then, using analytic skills, the students are asked to guess which word should be changed or eliminated to correct the meter. Various approaches are tried until the group feels that the poem has been "corrected." As a reinforcement, students are allowed to rewrite the poem by substituting words in the original text, but still maintaining the meaning and the meter. It is a great thrill for some ninth-grade students to improve on Robert Frost.

Using a data base, students are working on a module on the planets of the universe. First, the teacher discusses the planets and asks the students to consider what is important about each. The teacher then generalizes about types of characteristics that each planet has. For example, size, distance from the sun, number of moons, etc. Then, the teacher talks about the concept of data base and begins to describe the data base, developing the elements that will comprise the records. Once the students agree on the elements, there are assignments to locate the information on each planet. At group sessions, the information is loaded into the data base.

The teacher then poses certain questions that can be answered by querying the data base. For example, list the planets in descending order of size, or distance from the sun. A final activity involves the graphing of the data contained in the data base. This new representation of the information can present students with a new perception of the data, and often leads to more in-depth questions about the relationship among certain variables.

A last application involves the use of the spreadsheet and word problems. The teacher discusses word problems and emphasizes the need to set up the problem first. That done, the spreadsheet is used to enter base values and the relationship among individual variables. For example, a nickel is entered as .05. A dime is entered as 2* the .05 cell, etc. Then, other formulas are entered. Students are then encouraged to "guess" at the answer. Given an appropriate set of formulas, the students see the results of each guess and engage in successive approximations of the correct answer.

These are but a few of the applications that have been developed by classroom teachers. We find them exciting and feel that such application will pave the way for large scale use of computers in the instructional process.

APPENDIX A

TABLE 1

Core Software and Reference Material Donations

Software:	Number of copies	Description
DOS 1.1.	15	the PC operating system
Basic Primer	15	tutorial on Basic programming
Typing Tutor	15	typing instruction
Easywriter	15	word processing
pfs: File	3	data base management
pfs: Report	3	report generator
The Instructor	15	Intro to the PC
Question	15	CAI
Computer Discovery	15	computer literacy game
Free Enterprise	1	business game
Arithmetic Games	1	learning game
Books:		
Technical Reference Manual	1	PC component specifications
Hardware Maintenance and Service Manual	1	diagnostics

TABLE 2

Software Option List No. 1

Software	Description
Visicalc	Electronic Worksheet program by Visicorp
Multiplan	Electronic Worksheet by Microsoft
Peach Text	Word Processing program by Peachtree
pfs: File	Electronic Filing program by Software Publishing Corp.
pfs: Report	Report Generation program by Software Publishing Corp.
Home Budget	Personal Accounting software
Professional Editor	Text processor for programmers
Diskette Librarian	Utility program for organizing files
Personal Editor	Limited utility text processor
Macro Assembler	8086/88 Assembly Language compiler
ACS Communications Support	Data communications program
IBM BASIC Compiler	by Microsoft for DOS 1.1
IBM Pascal Compiler	for DOS 1.1
IBM Cobol Compiler	by Microsoft for DOS 1.1
IBM Fortran Compiler	for DOS 1.1
UCSD p-system Pascal	UCSD operating system w/Pascal
UCSD p-system Fortran	UCSD operating system w/Fortran
UCSD Pascal Compiler	
UCSD Fortran Compiler	
Computer Discovery	CAI Computer Literacy
Private Tutor	CAI authoring disk
Learning to program in Basic	Tutorial on BASIC programming

TABLE 2

Software Option List No. 1 (continued)

Software	Description
Arithmetic Games 2	Educational game
Free Enterprise	Educational game for business
Snooper Troops 1	Adventure game - mystery
Snooper Troops 2	more mystery
Cross Clues	reasoning game

TABLE 3

Software Option List No. 2

Software	Description
Monster Math	Math Game
Adventures in Math	Math Game
Snooper Troops 1	
Snooper Troops 2	
States n' Caps	Geography Game
Wordwhiz	Vocabulary Game
Wordskills-level 3	Vocabulary Game
Wordskills-level 4	
Wordskills-level 5	
Wordskills-level 6	
Free Enterprise	
Cross Clues	
Computer Discovery	
Private Tutor with...	
Learning BASIC	
Learning DOS 2.0	Tutorial on 2.0 operating system
Professional Editor	
Diskette Librarian	
Personal Editor	
File Command	Diskette Utilities
DOS 2.1	Updated PCDOS operating system
IBM Macro Assembler	
IBM BASIC Compiler	
IBM Pascal Compiler	

TABLE 3

Software Option List No. 2 (continued)

Software	Description
IBM Fortran	
UCSD p-system Pascal	
UCSD p-system Fortran	
UCSD Pascal Compiler	
UCSD Fortran Compiler	
Logo: Version 1	IBM Logo
Logo:program	with Turtle Graphics
CBASIC Compiler	Business BASIC Interpreter
PL/1 Compiler	PL/1 Language Compiler
Visicalc 1.2	Updated Electronic Spreadsheet
Multiplan 1.1	Updated Electronic Spreadsheet
Peachtext	
pfs: File	
pfs: Report	
dBase II	Data Base Management
BPI General Accounting	
Home Budget	

APPENDIX B

OUTLINE OF CURRICULUM MODULE

A. Goal:

To produce model instructional modules for use in various aspects of the regular high school curriculum. The modules will feature use of the computer as a tool to illuminate and enhance instruction.

The modules will focus on one topic and will encompass a two-week unit of duration (or slightly more). They will be carefully developed and field tested. They will serve as models for future development in that curriculum area.

B. Types of modules:

1. Build around existing utilities: word processing, spreadsheet, data mgr., telecommunications.
2. Build around existing instructional software, e.g. Question, Classroom Consortium Media, Karel the Robot, etc.
3. Build around authoring systems, e.g., CLAS, Private Tutor, Tutorial Quiz Master (Random House), PILOT.
4. Build around locally written software.
5. Combination of above.

C. Contents of a module:

1. Preliminary off-line activities
2. Computer activities
3. Accompanying materials:
   a. student worksheets
   b. background reading
   c. teacher guide, including bibliography, lesson plans
   d. data diskettes
4. Post-unit materials
   a. enrichment
   b. review
   c. evaluation activities
5. Documentation
   a. Guide to developing similar materials
   b. Experiences using module in classroom

D. Characteristics of a module:

1. Not a continuation of traditional teaching techniques and strategies, but,
2. it does connect with the reality of the classroom: class size, time allotment per day, typical students served, expertise of teacher not assumed.